Cambridge Society for
Industrial Archaeology

Cheddar's Lane

W. L. Read *Staff, Cheddar's Lane, 1947-1962*

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Running and maintaining a steam pumping station : the duties of workmen at Cheddar's Lane sewage pumping station, 1894-1968.

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Introduction

With the closing down of the pumping station at Cheddar's Lane, a local example of the use of steam power came to an end. With it passed a certain type of job, so familiar to thousands of men during the great age of steam, which one might say bred a certain type of man. For in order to maintain steam power of the magnitude required, prodigious and unremitting labour was needed from a number of men. Working conditions varied from the sparkling cleanliness of the engine room to the extreme filth and squalor of the stoke hole.

When the time came to close down the steam engines at Cheddar's Lane, and the new electric pumping station took over, the march of progress had overtaken a band of local men and their jobs. Little did they think, when they turned their backs on the old station for the last time, that it would not be razed to the ground. No doubt to their surprise and pleasure, the efforts of a group of enthusiastic local engineers and others to save the station were successful, and enlightened city councillors and city officials agreed to preserve the station and its equipment intact; this would form the basis of a proposed Museum of Technology.

In May 1966 the stoker at Cheddar's Lane made up the fire of the boiler for the last time; he watched the fire die—steam was not wanted any more. Shovels were flung down, the stoker washed his hands and left. The

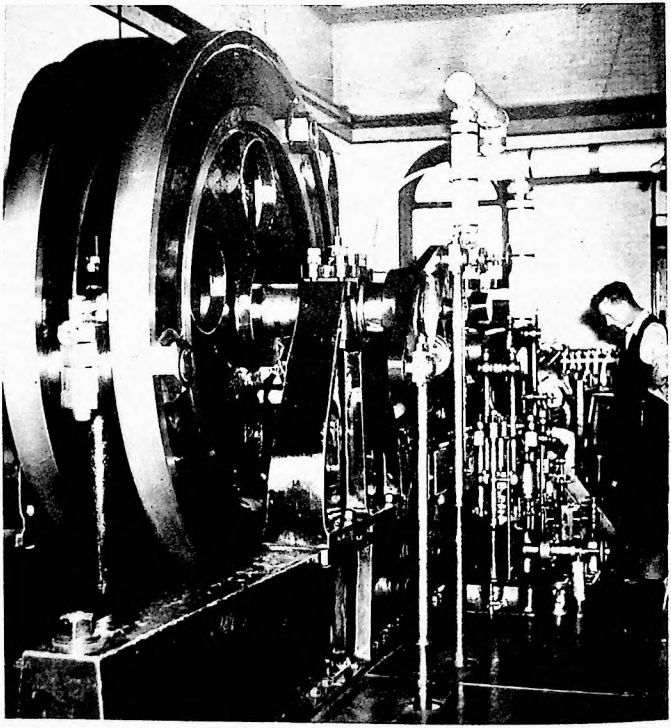

Fig. 1

Cheddar's Lane Pumping Station, 1894-1968

One of the two Hathorn-Davey 80 h.p. compound steam pumping engines. A driver, Percy Lyons, is watching the Davey differential valve gear. Circa 1959.

driver stopped the pump, for both driver and cleaner it was a solemn and sad moment, the old engines had breathed their last, the hiss of steam and the thumping of the pumps would never be heard again. To the engine room staff the engines were living beings, each with its own character, to be cursed or encouraged, petted or cajoled to give of their best. In the new stillness footsteps rang out on the steel chequer plates; a silence never heard since 1894 was present; the pumping station was dead, the building began to get cold. Sadly the drivers and the cleaners put away their oil cans and tallow tins. The old skills were not needed any more. To some a life's work had prematurely ended. The fortunate four, who were chosen for duties in the new electric pumping station changed their greasy overalls for new white boiler suits. They replaced their oil can and rag with clipboard and pencil; eyes that had anxiously watched steam and vacuum gauges would now have to readjust to dials of amps and volts. Deft fingers that had operated valves and cocks would now manipulate switches and buttons. For a third of the original staff, electrical power and the push button age had arrived.

ENGINE ROOM STAFF

The drivers

During the latter period of its career the pumping station was operated by a staff of 15:—

An engineer manager in charge
One engineer undermanager
One substation fitter maintenance assistant (W. L. Read)*
Three drivers (one for each shift)
Three cleaners
Three stokers
Two yardmen
One destructor labourer†

There was a three shift-system: 6 a.m.—2 p.m., 2 p.m.—10 p.m., 10 p.m.—6 a.m.

The principal machinery consisted of:—

1 Two Hathorn Davey lift and force pumps driven by two 80 nhp tandem steam engines. Installed 1895. These were used singly in alternate weeks.
2 Two 15-inch diameter Rees Roturbo centrifugal pumps driven by 94 hp gas engines operating on town gas. Installed 1909 and replaced in 1935 by Gwynnes pumps.
3 One 18 inch diameter Gwynnes centrifugal pump driven by 114 hp electric motor and pumping into the stormwater tanks only. Installed 1937.
4 Crompton Parkinson lighting generator of 2 kw output powered by Bumpstead and Chandler 4 nhp steam engine.

As well as assisting with special tasks at Cheddar's Lane his job entailed the servicing of eleven automatic sewerage substations within the borders of Cambridge. The most important part of this was the servicing of the electrical float switches in all of the substations.

†*Originally nine men were employed in operating the refuse disposal destructor and general duties. In 1942, however, the disposal of household refuse in the destructor was discontinued, the calorific value of the refuse having fallen to such a level that combustion was no longer economical. Since that date the coke-fired boiler provided the main steam supply, the destructor cells being used only for trade refuse and standby duty.*

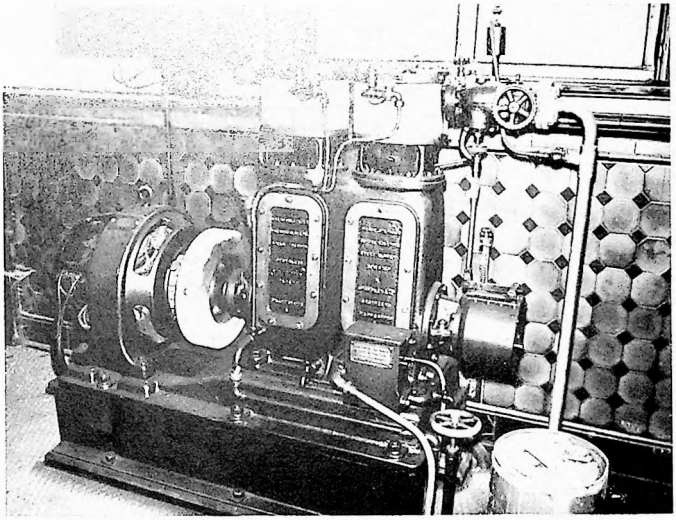

Fig. 2 *Crompton Parkinson 2 kw lighting generator, powered by Bumpstead and Chandler 4 n.h.p. steam engine.*

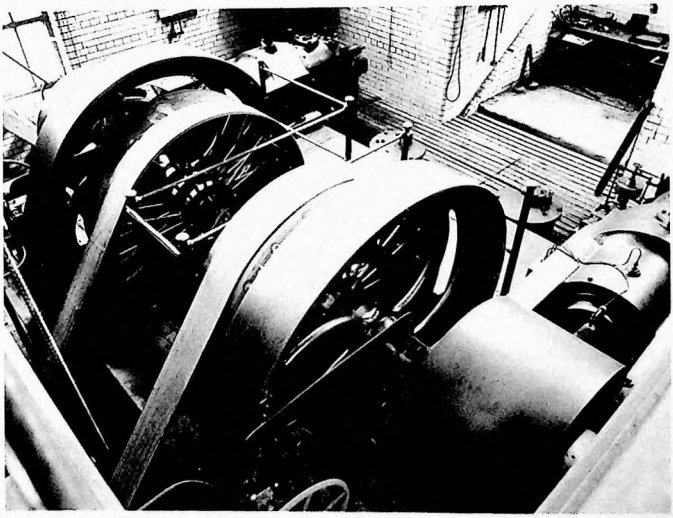

Fig. 3 *Two 94 h.p. gas engines installed 1909. These originally drove two 15 inch diameter Rees Roturbo centrifugal pumps but these were replaced in 1935 by Gwynnes pumps*

5 A. G. Mumford flywheel donkey steam engine used as a boiler feed pump or for pumping river water to a header tank on the roof of the pumping station. Installed about 1900.

6 Worthington Simpson steam driven pump for circulating cooling water in the gas engine jackets.

The engine driver's overriding responsibility was checking the well, anticipating the future flow, and keeping the water down to a safe level. This involved an immediate decision based on the correct anticipation of two slow moving events. Firstly the movement of water down the sewers towards the well, and secondly the lengthy operations involved in the station to produce extra steam in time, or to prepare the standby gas engines for action. In addition to sewage effluent, the pumps had to cope with domestic waste water, and rainwater drained from roofs in Cambridge City. Incidentally, rainwater normally drained off the roads flows by gravity directly into the River Cam, and did not pass through the pumping station. The height indicator gauge showed him the height of the water currently in the well. The driver increased or decreased the stroke of the engine accordingly; between 0—13.5 strokes per minute. The R.A.F. weather station at Mildenhall would often telephone a warning of impending severe weather, such as a sudden summer storm, or a heavy winter snowstorm. Normally, however, it was up to the engine driver successfuly to combine his skill as driver in command with his assessment of imminent weather conditions. He would organise his main and standby machinery according to the exigencies of the weather. If he were badly caught out, or at fault, the sudden flow would flood the basement of the engine room — with most unpleasant results! The engine driver had to be constantly on the alert, as well as checking his gauges he would also be keeping as close an eye on the weather as the captain of a sailing ship. His danger points of the compass were upstream towards Cambridge and to the South West, to that local bad-weather quarter known as 'Coton in the Hole.'

A heavy shower on the other side of town would eventually bring a quick rise to the level of the water in the well. The driver would warn the stoker to be sure to keep steam up. As a precaution he would then tell the cleaner to prepare his first line of reserves — the two gas engines and their pumps. As soon as the water in the well rose, which meant that the steam engine was not coping with the flood, the gas engine would be started on a free belt (this was the cleaner's job). The pumps would be primed by steam allowed to condense in the pump and then the order given to "pull the belt over" and the pumps were connected to the engine drive. If the water level still rose, the second gas engine and pump would be brought into the battle.

Thus two distinct generations of power were working together and two generations of pumps (lift and force, and centrifugal) were combined for a single purpose. Perhaps a unique situation. If the combined efforts of steam and gas were inadequate, and the water level still rose, an even more modern form of power was brought in. This time the 114 hp electrically driven Gwynnes centrifugal pump was connected to the system. This array of pumps was usually sufficient to cope with the most severe conditions. The second steam engine was only brought in as well in times of extreme emergency. In any case during its off-duty week the idle steam engine was undergoing general servicing and repairs.

It should be mentioned that an essential part of the reserve or emergency sewerage system was the creation of three storm water tanks. These are used only when the flow of water is too great to be acceptable to Milton Road Sewerage Farm. The discharge from the electrical pump was always channelled to the large storm tank; the discharge from one of the gas driven pumps could also be channelled into this tank as required. These reserve

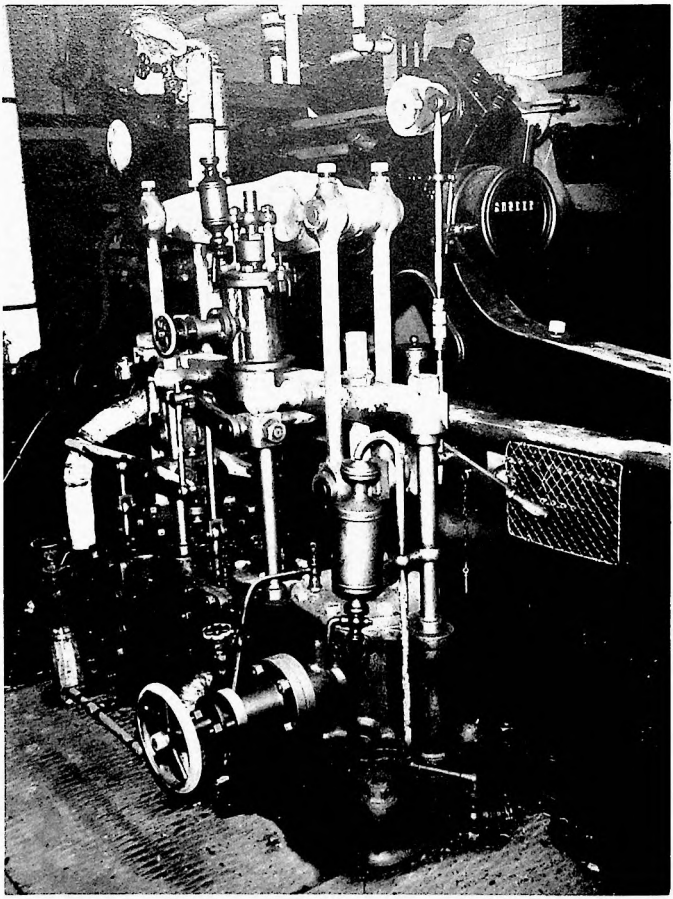

Fig. 4 *The Davey differential valve-gear which automatically regulates the supply of steam to correspond with the load on the pumps.*

tanks work the same with the present system as with the old system; they are designed to hold the storm water until it can be pumped back to the sewage farm after the storm. On the most rare occasions when these become overfull, discharge of the top surface into the Cam is the last resort.

The engine drivers were responsible for operating much complicated and ingenious machinery. The two main steam engines, the Hathorn Davey engines, are now — as far as we know — the only survivors of a special type of pumping engine once much in service. What makes them so interesting is that they are the ultimate development of the beam engine. Their big double discs are not flywheels at all; they do not completely rotate, but rock back and forth as the beam of a beam engine. These rocking levers conveniently convert the horizontal to and fro stroke of the piston rod into the up-and-down motion required for the pump rods, and in such a way that the force on the pump is the same throughout the stroke.

Another feature that makes them so special is the way in which the supply of steam is automatically regulated to correspond to the load on the pumps. This is achieved through a most complicated device known as the 'Davey differential valve gear'. Note references.

Each week one engine had to be stopped and the other started. To start one of the Hathorn Davey engines involved a series of actions which would take about one hour.

The starting procedure was roughly as follows:—

Grease and oil the engine.
Fill all the oil cups.
Drain the displacement lubricators and fill with steam cylinder oil.
Warm the engine through (i.e. by opening up the small cocks and the cylinder drains and allowing steam to 'warm through' the engine and valve gear).
Top up dash-pot-fillers.
Set the high pressure cylinder snubbing valves.

The engine should now be ready to run. The method of starting, assuming the Meyer's slide-valves are correctly set, would be:—

Close drain cocks.
Open main steam valve slightly.
'Crack open' the main dash-pot bypass valve. Having disconnected the main linkage to the valve-gear main steam cylinder slide-valve, this valve is operated by hand to cause the cataract slide-valves to admit steam to the high and low pressure cylinders.

The engine will now move slowly

The linkage is now reconnected with the engine, moving so as to reverse the engine at the end of the stroke. This is done by triggering the dwell steam cylinder slide valve, which, acting against a further dashpot, after a suitable dwell, or pause, reverses the valve gear main slide valve position.

The engine now runs automatically.

The engine driver's chores were many: he oiled, greased and packed the glands of his engine. He made sure his top tank was full; the donkey pump (the Mumford feed pump) supplied this from the river. This tank supplied essential water services such as boiler feed, hoses for washing down, and cooling water for the gas engines. He made sure his condenser was free and the water supply to the boiler as it should be (i.e. the de-oiling plant was functioning adequately).

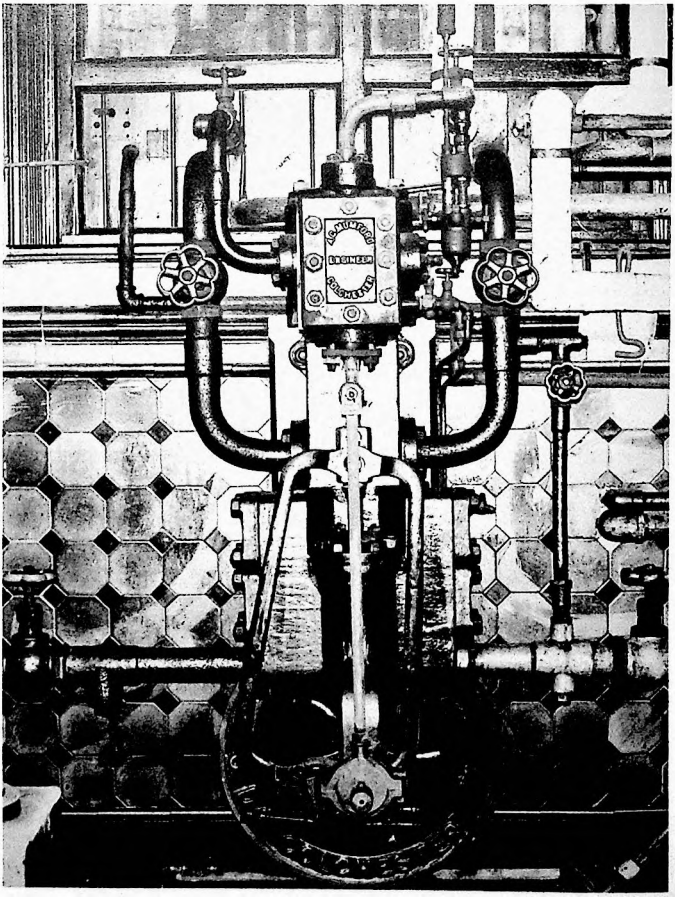

Fig. 5 *A.G. Mumford flywheel donkey steam engine used as boiler feed pump for pumping river water to a header tank on the roof.*

The cleaners

The cleaning and polishing of the engines and engine room was the unremitting task of the three cleaners, day and night; the complete cycle of cleaning lasted one week; jobs were regularly allocated by the hour to different men on different shifts. Most of the cleaning of the steelwork on the engines was accomplished with bath brick and paraffin, wiped down and then tallowed. The brass work was polished and so was the woodwork. As a result the engines were always immaculately maintained and kept in a state of high efficiency. Indeed they served Cambridge well and were in continuous use for 72 years. Although 'bull' was definitely the order of the day, the drivers and cleaners took a great pride in their work. Even to enter the engine room was a problem; every Thursday the floor was scrubbed white (and it was a long way round) and the chequer plates black-leaded. Visitors were required to state their business on the mat, and no-one stepped forward until a foot-wiping session and permission had been given. Friday was another 'black' cleaning day in which 52 windows had to be cleaned inside and out, from the top of high ladders! How many men today would put up with these conditions of work?

The stokers

However, it was the stokers who really had the toughest job. They performed duties and worked under conditions that would certainly not be tolerated today (we are only going back to 1962, not the 19th century!).

The main boiler, fitted 1932, was a Babcock water-tube boiler; the fuel used was the cheapest (breeze coke) and the worst. The fire had to be cleaned (mucking out) four times a shift. Wooden clogs had to be worn by the stoker to protect his feet from the hot ash. This entailed sweating work with pricker and hoe in front of a hot fire, and carrying at least two barrow loads of filthy ash, emitting choking sulphur fumes, to the cobbled front ready to be taken away by corporation lorries for path and road making. Before it went the manager would cast his eye over it, if he saw any wasted fuel the stoker would be told to remove it and "watch what he was up to".

Every bit of fresh fuel had to be wheel-barrowed in from the dump outside, in loads weighing 1½ cwt. each time. In all, about 20 loads had to be wheeled in per shift, but this varied, more if the coke was wet. When the fire was 'wet stoked' it had of course a damping effect and one had a situation in which the driver was crying out angrily for steam.

As with his colleagues on the railway, it was a heinous crime for the stoker to blow off steam. This was more apt to happen in the middle of the night when the load on the engines was greatly reduced. The safety valve lifted when the boiler reached 90 lbs; the noise it made can hardly be described. The high-pressure steam that was released passed through a 3 in. tube, 18 in. long, and then out to the atmosphere. It was a roaring organ! Unfortunately for the stoker the manager-engineer lived in the house on the site, and, along with the residents of Stanley Road, would be after him the following morning!

Among the most unpleasant jobs for the stokers was the cleaning of the enormous flues to the chimney, and the tubes in the various boilers, and the chipping of the drums (removing scale from the inside of the boiler drum).

The chimney barrel and flues had to be cleaned out once a year. This was a job that the maintenance men dreaded year by year. The barrel is the 'barrel shaped' cavity in the square base of the chimney about 10 ft. high. The flue of course is contained in the brick semicircular tunnel, about 8 feet high, between the destructor fires and the chimney which also contains the outlets from the other three furnaces.

Fig. 6 *Main duty boiler installed 1942. A good example of a Babcock water tube boiler. Firing was done through each firebox door alternately.*

This filthy job entailed two men working for three days, entering the flue by a trapdoor outside in the ground and literally shovelling the accumulated soot from deep inside the barrel and flue, by chain shovelling to the outside trapdoor. To clear the whole of the flue completely, a total of 8—10 tons of soot had to be shovelled out and carted away. Needless to say the men doing this work were as black as sweeps, and incidentally 'dirt money' was not awarded.

The boiler tubes were also cleaned once a year by means of a motorised worm. There were 80 tubes in the main boiler but this was a straightforward job, and had to be done when the boiler was closed down for maintenance. When the tubes were 'blown down' from the outside, to remove deposits of soot from the tubes' exterior, this was accomplished during the night shift, while the boiler was still on load. It created a temporary problem for the stoker, in that it spoiled his fire and made a further cleaning job.

An incident which occurred during main boiler maintenance shutdown is worth repeating. When this is scheduled the destructor boiler takes over the task of supplying steam to the engine. This can be fired from two different positions which are on two different levels: firstly, through fire-doors from the normal firing position at the base of the boiler on ground level, and secondly from the destructor furnace at high level, where tip-up trucks can disgorge their rubbish straight into the furnace through fire-holes in the floor.

On this occasion the 'destructor man' had left his post on the high floor and come down for his 'cuppa'. While he was away someone tipped into the upper furnace a great deal of celluloid. This created an enormous conflagration in the destructor, white-hot flames shot up to the roof which, under the intense heat, exploded with a tremendous crash. Soon the safety valve was blowing off and adding to the confusion. The fire brigade excelled itself and arrived in minutes, and soon had the fire damped down. Afterwards a fireman, looking down through the gratings of the destructor, saw to his amazement a stoker, completely unaware of the excitement, throwing coke into the furnace below as fast as he was able. The fireman shouted down asking if he, the stoker, wished to keep him there all day. The stoker, obviously a man of set ways and single purpose, replied, 'I've got to keep steam up for the engines'.

Working conditions

The original part of the pumping station, as built in 1894, is quite a good example of late Victorian architecture, solid and somewhat extravagant to modern eyes. It is the latter appendages that vie with each other as the worst excrescences. The inside presents many dramatic contrasts.

The main engine room is of pleasing proportions: natural light comes from side windows and from an elegant lantern in the centre of the roof The interior walls are covered with thousands of snow-white tiles, up to about 15 feet. The roof, sloping up to the lantern, is made of wood which glistened under a film of oil vapour carried up by escaping steam. The engines, each dominated visually by the big double discs and cylinders, stand up proudly amongst a complication of vertical and horizontal rods and moving parts. The gas engines in an adjacent room, however, skulk at the bottom of a pit and glower up, their belt drives disappearing towards even deeper and danker regions.

In the main engine room, the daytime scene, with sun streaming through the windows, was sparkling; scrubbed floor, washed walls and gleaming machines. At night, however, the scene was vastly different — someone was mean with the electric light. In the engine room a cluster of three

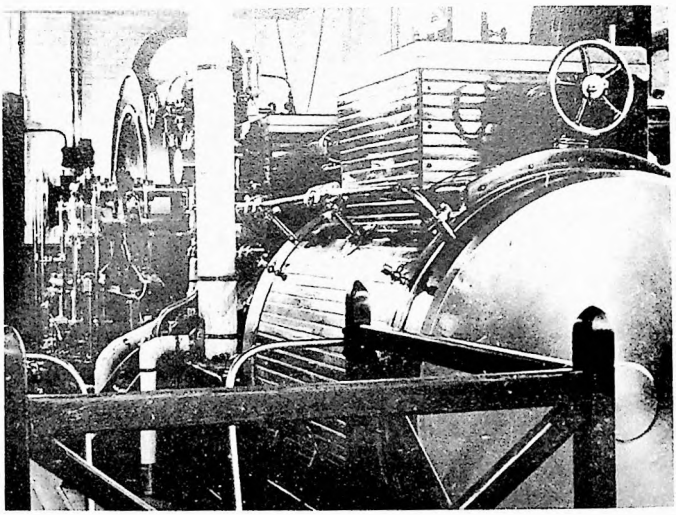

Fig. 7 *The low pressure cylinder of the north Hathorn-Davey compound steam pumping engine. The top section contains the slide-valve gear. Photograph taken 1967 by David Guyon.*

naked 110 volt bulbs, hung dead centre, between the steam engines. The long night shift was worked in an atmosphere made mysterious by shadows moving across white tiles, each keeping in time with moving machinery, the hiss of steam and the thump of the pump rods. Even the amount of light varied; until the 110 volt mains transformer was installed the steam driven generator fluctuated greatly if steam pressure dropped for any reason.

Of course no-one ever attempted to clean the stoke hole, and indeed why should they? This was the nearest one could get on earth to scenes from the nether regions. It was the epitome of all that was vile in the steam age and the Industrial Revolution. The few naked light bulbs, such as those on the head of the boiler drum which tried to illuminate the pressure and water gauges through a coating of dust, allowed a few gleams of light to filter through the chequered grills to the fire door - stoking was done alternately in glare and gloom, as the fire door was opened and shut. The atmosphere was always hot and dirty, not to say 'spooky'. The stokers were men who needed their beer!

Up to the late 1940's, working conditions of the staff were appalling. There were no showers, no hand basins, no lockers and no mess room. Due to the shift system men were forced to bring their meals with them; these were heated on the steam chests, and the general aroma of a steam engine - hot oil and steam - was enhanced by the delicious smell of bacon and eggs. Toast came out of the furnace on a shovel, and tea was brewed by popping a saucepan of cold water onto the white-hot coke in the furnace.

We must also remember that these men worked for 8 hours over the sewage well, with only carbolic liquid to act as disinfectant. We will spare our

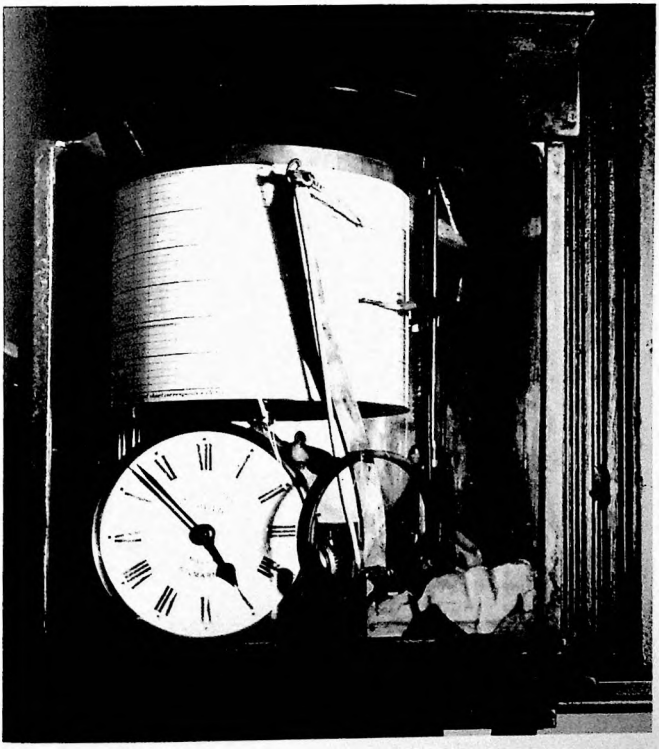

Fig. 8 *Combined clock driven water height indicator and steam graph recorders.*

readers details of the many unpleasant jobs these men were expected to take in their stride. With washing facilities completely non-existent it is a remarkable fact that there is no record of any serious disease, on the contrary, the men seemed to enjoy good health.

On the whole, relations between the staff were exceedingly good. Of necessity they were all hard men in their way, and pampering was not part of their make-up. It was a way of life dictated by the harsh conditions and nature of their jobs, yet they were quick to notice the arrival of the nesting swallows and swifts returning to their nests among the destructor shed girders, they knew this heralded spring, the end of early morning frosts, and the budding of the willows along the river banks.

If there were quarrels among the men there were recognised ways of paying each other out. For example, if a cleaner had let an engine driver down in some way, the driver would deliberately decrease the strokes of his engine so the well water would rise above the clack box floor, then the driver would pump it down again, leaving sewage waste on the wooden clack box floor. Thus the poor old cleaner, whose duty it was to maintain the cleanliness of the floor, had to go 30 feet down into the well, on his own, and clean, to say the least, a highly slippery and unpleasant mess.

To stop strife between the stoker and the engine driver, the engineer was forced to invent and install a steam graph recorder, and incorporate this with the Water Height Indicator. This showed any variation in steam pressure in relation to the Height Indicator and the time of day. Before this, if a stoker had fallen out with a driver he would deliberately let the steam pressure drop, consequently the engine would slow, the 'water' would rise in the well (pity the poor old cleaner) and this would be recorded on the water height chart which involved the driver in trouble with the engineer. He would then be accused of not running his engine in accordance with the requirements of the Height Indicator. The cleaner also would have had a few words to say to the driver!

In these days of poor relations between managers and men it is refreshing to place on record the admiration the men of the pumping station reserved for their manager, Mr. Frank Scott. In the day to day running many problems and disasters arose which were always surmounted. Towards the end of their working life the equipment began to fail. To keep the engines going became a great problem, but they were kept going to the last. Mr. Scott has now retired, but his leadership and example will not be forgotten by those who served with him.

Conclusion

Today, from any vantage point overlooking Cambridge, the skyline is dominated by mediaeval towers and church spires, symbolising Cambridge's contribution to the age of learning. There is also the dirty great chimney belonging to Cheddar's Lane, for like the pumping station itself this will also be preserved. As chimneys go it is a beauty, and skilfully constructed, fully 170 ft. high, octagonal in plan form, and complete with ornamental brick-work and lipped top.

One can hardly expect our visitors to view our distant chimney with the same enthusiasm as they will no doubt reserve for the University. Nevertheless, it can be stated that it is a worthy monument to that most significant era in the history of man — the beginning of the technological age, when steam power provided man's first experience with mechanical power on a massive scale.

The design and operation of steam plants and engines brought forth a

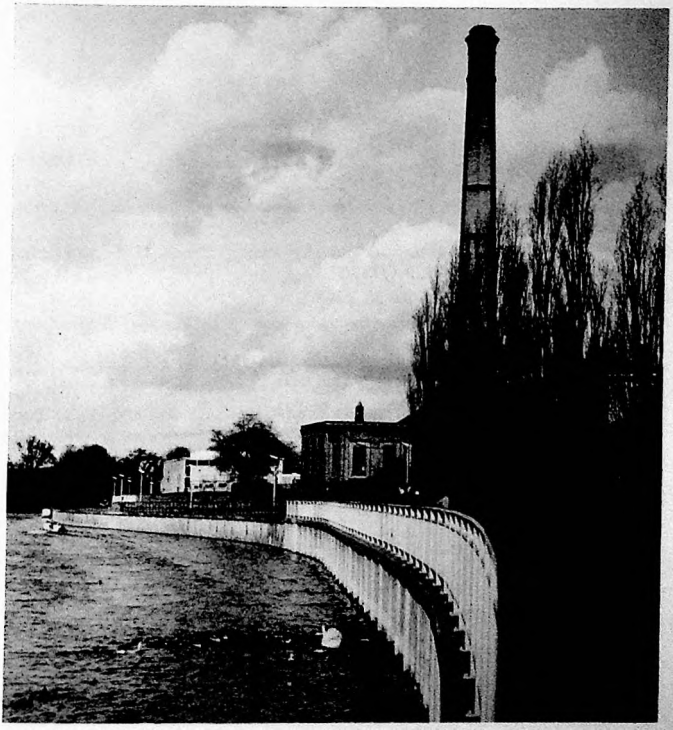

Fig. 9 *Riverside, Spring 1971. The defunct Cheddar's Lane steam pumping station occupies an ideal site for the proposed Museum of Technology. The new all-electric pumping station is in the background. In between is one of the storm water tanks.*

host of brilliant inventors and a breed of competent and tough men to run them. The old pumping station at Cheddar's Lane as it has been left, and even more if it is developed into a museum of technology, will be Cambridge's monument to the steam age.

Further reading

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